XIII. NOTES ON INDIAN ODONATA.

By F. F. Laidlaw.

Subfamily *AGRIONINAE*, Selys.

(= *Coenagrioninae*, Kirby).

Genus **Ischnura**, Charp.

Represented in the Indian Empire so far as is known by six species; one of these is possibly to be referred to a distinct genus when better known. Two species are of a wide distribution, the remainder probably have a restricted habitat.

The genus itself is a dominant member of the Agrionine group, and the Indian area therefore shows a high percentage of endemic species. *Ischnura* is one of the genera which appears to be poorly represented in equatorial regions, having a richer representation in tropical and especially N. temperate countries.

Ischnura senegalensis (Ramb.).

Micronympha senegalensis, Kirby, *Cat. Odonata*, p. 141 (1890).
Ischnura senegalensis, Ris, Katalog des Odonata von Südafrika, in L. Schultze, Forschungsreise im west. u. zent. Südafrica, Jena 1908, p. 310.
,, ,, Martin, *Mem. Soc. Zool. de France*, 1901, p. 246.
,, ,, Tillyard, *Proc. Linn. Soc. N. S. Wales*, 1912, XXXVII, 3, p. 451.

34 ♂♂; 10 ♀♀ (isochromatic); 12 ♀♀ (heterochromatic), No. $\frac{8327}{20}$.

The isochromatic females were all taken in Calcutta on July 27th, 1914. They can be distinguished from the males only by careful scrutiny. Eighteen males were taken with them.

2♂♂, 4♀♀ are from the salt lake below Chingrighatta, Calcutta, 12-ii-15 (*F. H. Gravely*), No. $\frac{100}{\text{H.I.}}$. 1♂1♀ Rangoon, No. $\frac{245}{\text{H.I.}}$. The remainder from Orissa, Puri District, Nos. $\frac{8213}{20}$, $\frac{8251}{20}$, $\frac{120}{\text{H.I.}}$; Sar Lake, No. $\frac{116}{\text{H.I.}}$.

The species breeds in the Museum tank in Calcutta, and probably in Lake Chilka. The African and Oriental representative of a group of closely allied species whose distribution is well-nigh cosmopolitan.

Ischnura forcipata, Morton.

I. forcipata, Morton, *Trans. Ent. Soc. Lond.*, 1907, p. 306, pl. xxiv, figs. 1, 2, 3.
I. gangetica, Laidlaw, *The Entomologist*, Aug. 1913, p. 235, text-fig.

Not represented in the Museum collection.

A green (or blue) and black species readily distinguished from the other similarly coloured Indian species (*I. senegalensis*) by the pterostigma of the fore-wing which is much narrower in front than behind and has its hinder margin very strongly convex. In this respect it resembles *I. aurora*.

The female remains unknown. Length of abdomen ♂ 24 mm., hind-wing 15 mm. Recorded from Quetta (*Morton*) and Kumaon (*Laidlaw*).

Range probably restricted to the foot hills of the west and central Himalaya.

The type male of *I. gangetica* is in the British Museum.

Ischnura rufostigma, Selys.

Micronympha rufostigma, Kirby, *Cat. Odonata*, p. 143 (1890).
Ischnura rufostigma, Morton, *Trans. Ent. Soc. Lond.*, 1907, p. 307 (?).
,, ,, Laidlaw, *Rec. Ind. Mus.*, VIII, 4, p. 344, pl. xvi, fig. 5.

2 ♂ ♂, 2 ♀ ♀, Calcutta, 4-i-15, No. $\frac{8329}{20}$.

The female has not been described (see note under *I. inarmata*).

Pterostigma dull gray.

Head, prothorax and thorax as in the male, but with a duller ground colour.

Abdomen rather stouter than in the male. Ground colour pale yellowish-brown, with a metallic black line on the dorsum of each of the segments, this line is moderately broad, pointed in front, and widening a little at the apex of each segment.

Range: Bengal, Assam, and doubtfully Kashmir (see note under *I. inarmata*, Calvert).

Ischnura inarmata, Calvert.

Ischnura inarmata, Calvert, *Proc. Acad. Nat. Sci. Philadelphia*, 1898, pp. 147-148, text-figs. 1, 2.

2 ♂ ♂, 1 ♀ ?, Kashmir, 1915 (*H. T. Pease*).

The female appears to have been taken at the same time and place with the males, and is in all probability con-specific.

It seems also to belong to the same species as 3 ♀ ♀ recorded by Morton from Kashmir (*Trans. Ent.-Soc. London*, 1907, p. 307).

These specimens were however regarded by him as being possibly examples of *I. rufostigma*, Selys.

Against this view is the fact that the undoubted examples of females of *I. rufostigma* described in this paper are quite different in their colour characters, and also the probability that *I. rufostigma* has a more easterly distribution.

On the other hand Calvert describes a female specimen regarded by him as the female of *I. inarmata*, which also is quite distinct in colouring from the specimen before me, whilst it does not agree with Morton's specimens; it may be added that his account of the

female is very incomplete, no mention is made of the thoracic colouring.

Possibly the species has dimorphic females. In the absence of clearer evidence I propose to take this view. But of course *I. rufostigma* may have dimorphic females. I tabulate these female forms below:—

A. 1 ♀. Indian Museum.
Head as in male *I. inarmata*, but ground colour orange instead of blue.
Prothorax orange, with small paired black spots.
Thorax orange.
Abdomen, segments 1—3 orange, apex of 3 marked with black, remaining segments metallic black above.

B. 3 ♀ ♀. (Morton's specimens). "Like *Pyrrhosoma tenellum* (Villers), but thorax paler" (identical with A. ?).

C. 3 ♀ ♀. (Calvert's specimens). Head coloured as in males.
Dorsum of abdominal segments 1—10 dark metallic green, the articulations with narrow, yellow, transverse rings.
This species is recorded from Kashmir only.

Ischnura aurora, Brauer.

Micronympha aurora, Kirby, *Cat. Odonata*, p. 143 (1890).
Ischnura delicata, Martin, *Mem. Soc. Zool. de France*, 1901, p. 246.
,, ,, Tillyard, *Proc. Linn. Soc. N. S. Wales*, 1907, XXXII (2), p. 384 *seq.*

2 ♂ ♂ 1 ♀, Nagpur, C. P., 1000 ft., Oct. 1914 (*E. D'Abreu*). In bad condition.

Range: India to Ceylon; Australia, not recorded from intermediate territory so far as I know.

Apparently not very common though widely distributed in India.

Ischnura ? nursei, Morton.

Ischnura ? nursei, Morton, *Trans. Ent. Soc. Lond.*, 1907, p. 306, pl. xxiv, figs. 4, 5, 6.

A red and black species, unknown to me. The abdomen is described as being short and stout relative to that of other males of the genus; "segments 1—4 carmine, 5 lemon yellow, 6 yellowish in anterior half, remainder of abdomen metallic violet, posterior part of 10 and appendages reddish." The species differs from other *Ischnuras* in the absence of post-ocular spots and is referred by Morton to this genus with doubt. The pterostigma of the fore wing is diamond-shaped, bright carmine inwardly, paler exter-

Ischnura immsi, Laidlaw, *The Entomologist*, Aug. 1913, p. 236. Mr. Morton has pointed out to me (*in litt.*) that this species is identical with *Enallagma? parvum*, Selys. My name is therefore merely a synonym of Selys' species to which I hope to refer in a later note.

nally, that of the hind wings small, yellow. Length of hind-wing 12 mm., of abdomen 16½ mm.

Recorded from Deesa, Gujerat.

It is to be hoped that more examples of this very interesting species will be forthcoming before long.

Genus **Ceriagrion**, Selys.

Ceriagrion coromandelianum (Fabr.)

Ceriagrion coromandelianum, Kirby, *Cat. Odonata*, p. 154.
,, ,, Martin, *Odonat. Mission Pavie* (sep.), p. 18.
,, ,, Ris, *Abhandl. d. Senckenberg. Naturf. Gesellsch.*, XXXIX, p. 519.
,, ,, Morton, *Trans. Ent. Soc. London*, 1907, p. 308.
,, ,, Laidlaw, *Rec. Ind. Mus.*, VIII, p. 345, pl. xvi, figs. 8, 8*a*.

Many specimens, ♂ ♀. Kierpur, Purneah District, Bihar, 7—9-x-15 (*C. Paiva*). No. $\frac{854}{H.I.}$

Many specimens, ♂ ♀. Maidan, Calcutta.

♂ ♀. Ernakulam, Cochin State, 11—14-x-14 (*F. H. Gravely*). No. $\frac{8229}{20}$.

♂ ♀. Calcutta. Nos. $\frac{3460}{8}$, $\frac{8300}{4}$. } Labelled by de Selys.
♂ ♀. Sibsagar, Assam. Nos. $\frac{6325}{20}$, $\frac{6326}{20}$. }

Range: Ceylon, India, Burma, Indo-China (Sunda Islands, Celebes are also given as included in the range of the species by Martin, *loc. cit.*).

My figures of the anal appendages of the male are not satisfactory. They were drawn from a shrivelled specimen. Normally the inferior pair project directly backwards and slightly exceed the upper pair in length. Each member of a pair is curved inwards at its free extremity, the upper pair actually meeting in the middle line. The lower appendage has its free extremity more finely pointed than in the figure and tipped with black. Also when viewed directly from above the extremities of the lower pair can be seen projecting beyond the upper pair.

Ceriagrion rubiae, sp. nov.

2 ♂ ♂, 1 ♀. Chalakudi, Cochin State, 14-ix-14 (*F. H. Gravely*). No. $\frac{8248}{20}$.

Length of abdomen: ♂ 26 mm., ♀ 27 mm.
,, hind-wing: ♂ 18 mm., ♀ 18·5 mm.

A small species in which the wing is petiolated to the level of the basal post-costal nerve; the wings are uncoloured, and the excision on the hinder margin of segment 10 of the male abdomen is small and rather bluntly angular.

Description: Post-costal nerves 10.

♂ Head rusty yellow, paler beneath; upper half of the eyes greenish-brown, lower half yellow.

Prothorax and thorax rusty yellow above, fading to pale yellow at the sides and underneath.

Abdomen entirely reddish-orange above and at the sides, yellow ventrally.

Legs yellow with black spines.

Anal appendages dark reddish-brown in colour, black at extremities. The upper pair are distant to each other and parallel, seen in profile they are a little narrowed basally so as to be somewhat club-shaped, each carries a fine black point distally, which is directed downwards. The lower pairs are larger, directed upwards and taper regularly to their apices. They lie internally to the upper pair. The excision on segment 10 is small and shallow, bluntly angular; barely one third as deep as the segment. The floor of the excision is formed by a shelf-like ridge which in the middle line has a small tongue-like projection directed backwards.

♀. Head greenish-brown above, paler below, eyes similarly coloured but of a greener tone.

Prothorax and thorax gray-green above, yellowish-white below.

Abdomen dull, greenish-brown above, paler below.

The species differs from the closely allied *C. erubescens*, Selys, chiefly as follows:—in colour; it is smaller, and the excision on segment 10 of the abdomen is bluntly angular, narrow, and its floor has the curious little tongue-like projection noted above. The anal appendages of the males of the two species differ in detail.

C. erubescens appears to be a more eastern species and I cannot find that it has been recorded from India. (See Ris, *Abhandl. d. Senckenberg. Naturf. Gesellsch.*, Bd. XXXIV, p. 519, taf. xxiii, figs. 13, 14).

The holotypes ♂ ♀ will be returned to the Indian Museum; paratype ♂ in my collection.

Ceriagrion olivaceum, Laidlaw.

Ceriagrion olivaceum, Laidlaw, *Rec. Ind. Mus.*, VIII, 1914, p. 345 pl. xvi, fig. 9.

This is the largest of the four species recorded from the Indian Empire. It appears to be confined to Upper Burma and Assam.

A female specimen from Nurbong, Assam, sent to me by Mr. Stevens, has only 12 post-nodal nerves on the fore-wings.

Like the other Indian species it has the wings petiolated to the level of the basal post-costal nerve.

Ceriagrion cerinorubellum (Brauer).

Ceriagrion cerinorubellum, Kirby, *Cat. Odonata*, p. 154.
,, ,, Kruger, *Stettin Entomol. Zeit.*, 1898, p. 119.
,, ,, Ris, *loc. cit.*, p. 519.

9 ♂ ♂. Kierpur, Purneah District, Bihar, 19-ix-15 (*C. Paiva*) "resting on weed in stream." Nos. $\frac{852}{H.I.}$, $\frac{862}{H.I.}$.

The description given by de Selys of this insect scarcely does justice to its beautiful colouring which is well preserved in spirit specimens. The head, prothorax and thorax are a rich dark olive green above, passing on the sides to a beautiful shade of blue.

The first three segments of the abdomen and the last three are of a beautiful cherry red colour, the intermediate segments being intense black.

Range: Ceylon, India, Burma, Malay States, Sumatra, Borneo.

A number of the larvae of *C. coromandelianum* (Fabr.) were taken in the Museum tank, and were hatched out in the Museum (No. $\frac{6599}{20}$). The larva shows, especially in the structure of the anal lamellae, considerable differences from the larva of such a genus as *Pseudagrion*. The following is a brief account:—

Body sandy yellow or brown in colour. Total length about 20 mm. including the anal lamellae.

Head broad, flat. I can find no indication of the transverse frontal ridge of the adult.

Mask when folded just reaching base of second pair of legs. Its outer margin carries about 6 or 7 short stout spines along its distal half. On either side of the middle line is an oblique row of 5 setae, diverging distally; the outermost being by far the largest. Anterior margin of mask bluntly angular. The palpi each bear 7 long setae in addition to the moveable hook (see fig. 1). The length of each of the middle pair of legs is about 7 mm.

Fig. 1.—Mask of larval form of *Ceriagrion coromandelianum* (Fabr.).

The abdomen is cylindrical and tapers very gradually backwards. Each of the segments has a ring of short blunt setae set around its hinder margin, and each of the last five segments has in addition a pair of similar setae dorsally, one on either side of the middle line near the end of the segment. The pair on segment 10 are much more remote from each other than those on the other segments.

The anal lamellae (gills) are leaf-like, ob-lanceolate; 4—5 mm. long, 1·5 mm. wide, in one or two individuals acuminate but more often irregularly rounded at the apex. They are not jointed nor marked with a transverse fold, but the basal half is stouter and more strongly chitinized than the apical part.

Each has two stout, main tracheal tubes forming as it were a mid-rib from which a large number of branches run outwards increasing the resemblance to a leaf.

In the lateral pair of lamellae the mid-rib lies nearer to the ventral than to the dorsal margin, in the central lamellae the reverse condition obtains.

In each lateral lamella the basal two-fifths of the mid-rib bears a row of chitinous teeth on its outer side. In the central

lamella there is a similar row of equal extent on both sides of the mid-rib.

Lastly, on the ventral margin of the outer pair, and on the dorsal margin of the central lamella there lies another row of teeth also extending from the base for about two-fifths of the total length of the lamella.

Subfamily *GOMPHINAE*, Rambur.

Genus **Davidius**, Selys.

Davidius aberrans (Selys).

Hagenius (?) aberrans, Selys, *Bull. Acad. Belg.*, (2) XXXVI, p. 506 (1873); Kirby, *Cat. Odonata*, p. 75.
Davidius ? zallorensis, Selys, *l.c.*, (2) XLVI, p. 667 (1878); Kirby, *l.c.*, p. 75.
Davidius aberrans, *D. zallorensis*, Williamson, *Proc. U. S. Nat. Mus.*, XXXIII, 1907, pp. 286-287.
See also Selys, *Ann. de la Soc. Entom. de Belgique*, XXXVIII, 1894, p. 175.

1 ♀. Binyar, Kumaon, 7700 ft., 24-v-1912 (*A. D. Imms*) For. Zool. Mus.

I have compared this specimen with the descriptions of *D. aberrans* and of *D. zallorensis* and can find no grounds for separating the two species. In the specimen before me the triangle of the left fore-wing is free, that of the right is crossed by a single nerve. Both hind-wings have the triangle crossed.

Davidius davidi, Selys, subsp. **assamensis**, nov.

Davidius davidii, Selys, *Bull. Acad. Belg.*, (2) XLVI, 1878, p. 671.

1 ♂, 2 ♀ ♀. Gopal, Assam, 1914 (*H. Stevens*).
Length of abdomen ♂ 31 mm., ♀ 28 mm.
,, hind-wing ♂ 26 mm., ♀ 28·5 mm.

Distinguished from the type by its smaller size (*D. davidi* type: abdomen ♀ 34·35 mm., hind-wing 32·33 mm. Selys, *loc. cit.*), and absence of isolated superior antehumeral spots of cuneiform shape which occur in the type. The basal black band on the frons is not large.

The male differs from the female so far as colouring goes chiefly in having only the lower third of the mid-dorsal carina of the thorax coloured, and in having lateral spots on the first three segments only of the abdomen.

Anal appendages of male: Upper pair slender and rather horn-like, each with a stout downwardly curved, rounded, hook-like process projecting from near its base, scarcely visible in profile. The appendage itself is longer than the tenth segment. The lower appendage is shorter than the upper pair, triangular and deeply cleft in the middle line (see fig. 2*a*).

The male has the triangle of the left hind-wing crossed, the remaining triangle free.

The females have the triangles of the hind-wing crossed in every case. Those of the front-wing free except in the case of the left fore-wing of the paratype where the triangle is crossed. The

Fig. 2.—*Davidius davidi assamensis*, subsp. nov.
a. Anal appendages ♂ : *b*. Lateral view of genital structures on abdominal segment, 2 ♂ .

genus *Davidius* ranges from China and Japan to N. India, Assam and Tonkin. The two species noted above are the only forms recorded from the Indian Empire.

The holotypes ♂ ♀ will be deposited in the Indian Museum.